On having our cake and driving it too

Food or Fuel—Will We Have to Choose?

BY NORMAN RASK

Milton Freidman is said to have defined economics in its simplest form with the expression, “there is no such thing as a free lunch.” Recent energy price increases have raised the production cost of food, making that lunch even more expensive. In addition, high energy prices have created incentives for several countries to turn directly to agriculture as a source of energy, extracting alcohol from several crops, including sugar cane and corn. Continued political instability in the Middle East intensifies this interest in domestic alternatives to oil. But most countries do not have the agricultural ability to produce a significant portion of liquid-fuel needs and still provide adequate food supplies. This raises concern about how agricultural resources should be used. The resulting food/fuel choice depends on a unique set of conditions in each country.

The United States has a key role to play in both energy and food matters. The U.S. consumes almost a third of all petroleum produced in the world, imports almost 50 per cent of its domestic petroleum needs, and is the major exporter of agricultural products. The sheer magnitude of both the U.S. demand for liquid fuels and its share of world agricultural trade makes U.S. policy choices on the food/fuel interface of critical importance domestically and in other areas as well.

The U.S. is in the early stages of a corn-based alcohol program; Thailand is considering using both sugar cane and cassava; and still other countries with surplus agricultural resources are looking carefully at the possibilities of alcohol programs. At current petroleum prices, however, alcohol is not yet an economic alternative for most countries, including the U.S. Consequently, alcohol programs depend on government support and protection and thus cannot be expected to reach massive proportions at this time. However, dwindling supplies of petroleum, rising prices, and continued uncertainty about imports add a premium to domestically produced energy. This virtually assures that a modest domestic alcohol industry in the U.S. will be politically desirable and economically attractive the 1980s.

With regard to food, the world is looking more and more to the U.S. as the last major residual supplier. Total U.S. agricultural exports account for about 20 per cent of world agricultural trade. While this amounts to only 3-4 per cent of the world diet, it does provide an important supplement for some food-deficient countries and for others an important buffer in times of bad crops. Both the demand and the supply of food are expected to increase in the '80s, with variable weather conditions responsible for periods of surplus and deficit. Toward the end of the decade some tightening in world food supplies is expected.

In the broadest context, the urgency of making food/energy choices will be determined by the world scarcity of either commodity and the subsequent impact of this scarcity on the price of one relative to the other. As noted, food-energy price relationships currently favor using agricultural resources for food production; but recent estimates suggest that energy supply problems will become more critical than food shortages during the '80s.

THE ENERGY TRANSITION

World energy resources are unevenly distributed in terms of known reserves, production, and use. Coal is the most abundant resource, representing over two-thirds of the fossil fuel reserves but less than a fifth of world energy use. Coal is found in abundance in only a few countries, with 31 per cent of the reserves located in the United States and 49 per cent in the Communist countries. Oil, which represents only about a sixth of the world energy reserves, is currently providing over a half of commercial energy use. Most of the oil reserves, and almost all of the free world trade in oil, come from Middle East OPEC countries. The rest of the world, including many industrialized countries, is relatively energy poor.

Oil is clearly the energy resource that dominates world markets. Very high-use levels relative to known reserves, historic low-production costs, ease of transport, and lack of readily available substitutes all point to the need for substantial changes in energy markets in the near future. Most future scenarios call for a supply shortfall during the 1980s concurrent with substantial increases in price and demand. Through late 1980, events in the world oil markets generally supported these predictions. New U.S. oil discoveries were running at only 20 per cent of U.S. oil use and 40 per cent of U.S. production. North Slope oil had temporarily raised U.S. production slightly, while Russian production plateaued. Saudi Arabia raised production temporarily from 8.5 million barrels a day to 9.5 million.

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barrels a day without indicating its willingness to maintain this increased flow on a sustained basis. The unexpected shutdown of Iranian production in early 1979 caused a temporary shortage of oil in world markets. The current conflict in the Middle East promises to add to this shortage.

Higher petroleum prices will in turn cause two general reactions: (1) a more serious attempt at conservation at least to moderate the increase in petroleum demand, and (2) an expanded search for alternative energy sources. In the liquid-fuel area, three major alternatives are being considered: the so-called synthetic fuels derived from shale oil and coal, and alcohol from biomass. Like oil, the shale and coal-based synthetic fuels are located in only a few countries. And capital, technology, and water requirements, along with environmental problems, are likely to delay substantial production of these fuels until the 1990s, well beyond the projected oil-supply shortfall. Biomass is a renewable resource and is currently available in various quantities in most areas of the world in both waste and food (or feed) forms.

Of course there are great uncertainties about how the energy markets will respond to changing supply and demand. Clearly, some conservation efforts will slow the growth in demand, while enhanced prices will result in greater oil exploration and make profitable secondary and tertiary recovery from existing wells. But these events are unlikely to reverse the trend (at least in the major oil-producing nations), hence world production of oil will continue to level off and then decline. The principal alternatives, shale oil and coal liquids, now estimated to cost $50-$60 per barrel, will become competitive with oil during the 1980s, with significant production delayed until the '90s. During the '80s, then, the only liquid-fuel alternative to petroleum is alcohol. Pricing and other policies can advance or delay the use of alcohol, but it is probable that some agricultural resources will be drawn away from food production and toward energy production within this period if energy markets are left free to reflect supply and demand conditions. Those countries with critical liquid-fuel supply problems and ample agricultural resources will likely provide incentives for alcohol production, advancing this timetable.

FOOD PRODUCTION AND USE
As in the case of energy, the basic food resources are unevenly distributed. Further, although land is in finite supply, the application of technology, capital, and labor has allowed the natural productivity of land to be increased several fold in many areas of the world. Energy in the form of fertilizer, pesticides, machinery, and irrigation has, of course, been a major ingredient in increased productivity. Thus, as energy prices rise, costs of producing food will also rise, especially in areas of intensive modern agriculture.

A commonly held concept is that the U.S., with its great surplus of agricultural production, should or could "feed the world." In fact, the greater part of food consumed in the world is produced in the consumption areas. The few exceptions are industrialized countries or raw material-exporting countries that generate sufficient foreign exchange earnings to enable them to purchase substantial foodstuffs (i.e., Western Europe, Japan) and those few agricultural countries with unique production resources for specific food crops such as sugar and coffee. The U.S. has an agricultural potential in the production of food and feed grains and soybeans well in excess of domestic needs and at cost levels that are highly competitive in world markets. As a consequence, almost 30 per cent of U.S. feed grain production (corn, sorghum, oats, barley), two-thirds of wheat production, and over a half of soybean production are exported. However, while exports of grains from the U.S. represent a significant quantity of U.S. production, they account for less than 7 per cent of world grain production. For example, Europe and the USSR together produce and consume more than four times as much wheat, as the U.S.

Trends in world grain trade show a significant erosion in the number of surplus production areas and the dramatic emergence of North America as the principal source of surplus grain. For instance, in the 1930s all major areas of the globe, with the exception of Europe, were surplus grain producers, with minor net quantities exported to Europe. Now, while individual countries may be net grain exporters, the major regions as a whole are not.

In spite of this regional difference, overall production in agriculture is increasing. Therefore, while the prospects for energy markets appear to point toward substantial price increases as limited supplies are balanced against rising demand, the projections for food markets indicate continuing production increases that will mitigate somewhat the price pressure from increased demand. World food production increased at an annual rate of just under 3 per cent during the 1970s, placing it slightly ahead of population growth. USDA and FAO projections through 1985 indicate that this relationship will be maintained, though there will be times and places of critical shortages. Some areas of the world will fare better than others. Food-production levels in Africa and Latin America, for example, have not kept pace with populations that are increasing at nearly 3 per cent per year. Asia is maintaining historic food/population balances and may be showing slight improvement. North America (principally the U.S.) shows strong potential for continued food-production growth well in excess of projected demand based on growth and income. Thus, barring abnormal weather patterns and
disruptions by nonmarket factors, a fairly constant real-price level for food may be projected through 1985. We can then expect an increase in the value of energy relative to food and, hence, an increase in the relative profitability of energy crops as they compete with food crops for the use of agricultural resources.

**BRAZIL—A TILT TOWARD ENERGY**

Over the past twenty years Brazil has had an ambitious industrialization program. Central to this program is the development of an automobile industry, a truck-transport industry, a highway system, and areas of highly mechanized agriculture. Strong and increasing reliance on petroleum has been a concomitant result of following this development path. Imports now account for over 80 per cent of petroleum use. Brazil is thus faced with the option of changing development strategy away from dependence on liquid fuels or developing alternative liquid fuels from biomass. Hydroelectric power and eventually shale oil are the only conventional domestic energy resources of significant quantity in the country.

Brazil has a large underutilized land resource. The agricultural potential of this resource is unknown but will add to the agricultural production base when developed. The current demand for liquid fuels relative to this agricultural base leads Brazilian authorities to project a probable substitution of biomass-produced alcohol for a major portion of liquid-fuel needs within a decade. Currently, over 20 per cent of gasoline needs are being met by alcohol.

The change to alcohol has been relatively easy in the initial stages, since some alcohol has been produced traditionally as part of a substantial sugar industry. Sugar cane, however, is grown on prime agricultural land, further expansion will put pressure on traditional food and export crops such as corn, coffee, and soybeans. Alternative energy crops, such as cassava and sweet sorghum, which have a broader regional adaptation and can be produced on more marginal land and under semiarid conditions, are being investigated and may eventually prove more important than sugar cane as a source of alcohol.

The strategic importance of a domestic liquid-fuel source is apparent in the Brazil case, since the political decision to proceed with a major plan was made when alcohol prices were at least twice as high as world gasoline prices. In the past year, as petroleum prices have increased rapidly again, the projected expansion rate for alcohol production in Brazil has been advanced significantly and the decision has been made to produce new automobile engines that run on pure alcohol.

**THE UNITED STATES—A CHOICE**

Unlike Brazil and many other energy-poor countries, the U.S has several options for dealing with liquid-fuel needs. The urgency of making a choice is beginning to be felt in political circles. Declining domestic oil production and an increasingly vulnerable oil-import situation are bringing economic, political, and national security concerns to bear on the energy choices. The alternatives are conservation, substitution of more abundant energy forms such as coal for oil in noncritical uses, synthetic-fuel production from coal and shale oil, and alcohol from biomass.

Within this framework, alcohol from biomass may play a small but critical role. If further delays in other options occur, the demand for alcohol could put substantial pressure on food-producing resources. First, it is important to note that the demand for liquid fuels in the U.S. far exceeds the capacity of agriculture to supply a significant portion. Gasoline needs alone are over 100 billion gallons a year. It has been estimated that 5 to 10 per cent of this need could be met by alcohol produced principally from idle land and waste products and without significantly affecting food prices. Beyond this level, a clear choice between fuel and higher food prices would have to be made. Second, the two major synthetic-fuel alternatives, coal and shale oil, cannot be brought on stream in any significant quantity until the 1990s, well beyond the expected shortfall in world oil production. New technologies and rising petroleum prices will probably make alcohol competitive by 1985.

Choices made outside the U.S. are also likely to affect U.S. food needs. For example, the U.S. is a major importer of such specialty food items as coffee, cocoa, sugar, tropical fruits, and winter vegetables. The principal sources of U.S. food imports are tropical countries that have surplus agricultural capacity, many of them are deficient in energy production. Because sugar cane is a major domestic crop for most of these countries, it is reasonable to expect that alcohol for local energy consumption and export will soon be produced, affecting availability and cost of U.S. food imports.

In sum, not only is there no such thing as a free lunch but, for much of the world in the future, choices that are made in the U.S. will determine just what is served and how much it costs.